UM0629
User Manual

STM8L101-EVAL evaluation board

Introduction

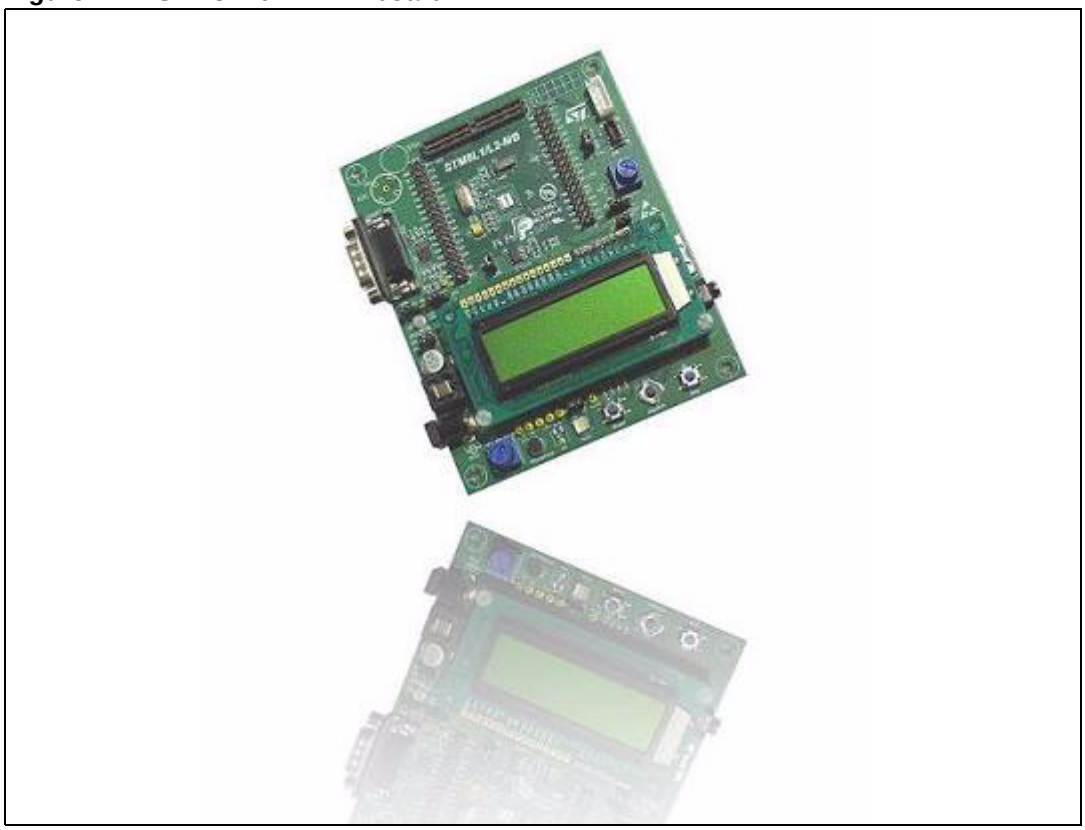
The STM8L101-EVAL is composed of two boards:

- An STM8L1/L2 motherboard called MB709 which includes all peripherals which are connected to the MCU on the daughterboard. The motherboard connects to the daughterboard via two 36-pin connectors.
- An STM8L1 daughterboard called MB710 which has an STM8L101 MCU and a STice connector.

The motherboard and daughterboard are a complete development platform for STMicroelectronic's STM8L101 microcontroller with comparator, I2C, SPI, USART and SWIM debugging support.

The full range of hardware features on the motherboard helps you to evaluate all peripherals (MicroSD card™, USART, IrDA®, EEPROM, LCD, for example) and develop your own applications.

Figure 1. STM8L101-EVAL board



Contents

1 Overview 4

1.1 Features 4

1.2 Hardware layout and configuration 5

2 STM8L1/L2 motherboard 8

2.1 Power supply 8

2.2 Reset source 9

2.3 Audio 9

2.4 I2C EEPROM 10

2.5 RS-232 10

2.6 MicroSD card 10

2.7 Analog input 10

2.8 Development and debug support CN5 and CN6 10

2.9 Display and input devices 11

2.10 Bi-color LED 11

2.11 Economic measurement and potentiometer RV1 11

2.12 MicroSD connector CN1 12

2.13 Daughterboard extension connectors CN3 and CN4 13

2.14 SWIM connectors CN5 and CN6 14

2.15 RS-232 connector CN8 15

2.16 Audio jack CN9 15

2.17 Power connector CN10 15

3 STM8L1 daughterboard 16

3.1 Power 16

3.2 Extension connector CN1 and CN2 16

3.3 STice connector CN3 16

4 Schematics 18

4.1 STM8L1/L2 motherboard schematic 18

4.2 STM8L1-DB daughterboard schematic 24

Appendix A STM8L101-EVAL I/O assignment 25

5 Revision history 26

1 Overview

1.1 Features

- 5 V power jack supply
- Audio play and record
- 64 or 128 Mbyte MicroSD card™
- 64 Kbit I2C EEPROM
- One channel of RS-232 communication
- Bi-color LED
- Economic analog voltage measurement based on comparator
- SWIM and STice debug support
- 122x32 dot-matrix serial interface LCD module
- Joystick with 4-direction control and selector
- Reset and User button
- 4 LEDs
- Extension connector for daughterboard
- One 10 K potentiometer

1.2 Hardware layout and configuration

The STM8L101-EVAL evaluation board is designed around the STM8L101K3T6 in an LQFP32 package.

Figure 2 illustrates the connections between the daughterboard and the peripherals on the motherboard (LCD, I2C EEPROM, USART, audio and MicroSD card).
Figure 3 and *Figure 4* help you to locate these features on the actual evaluation board.

Figure 2. Hardware block diagram

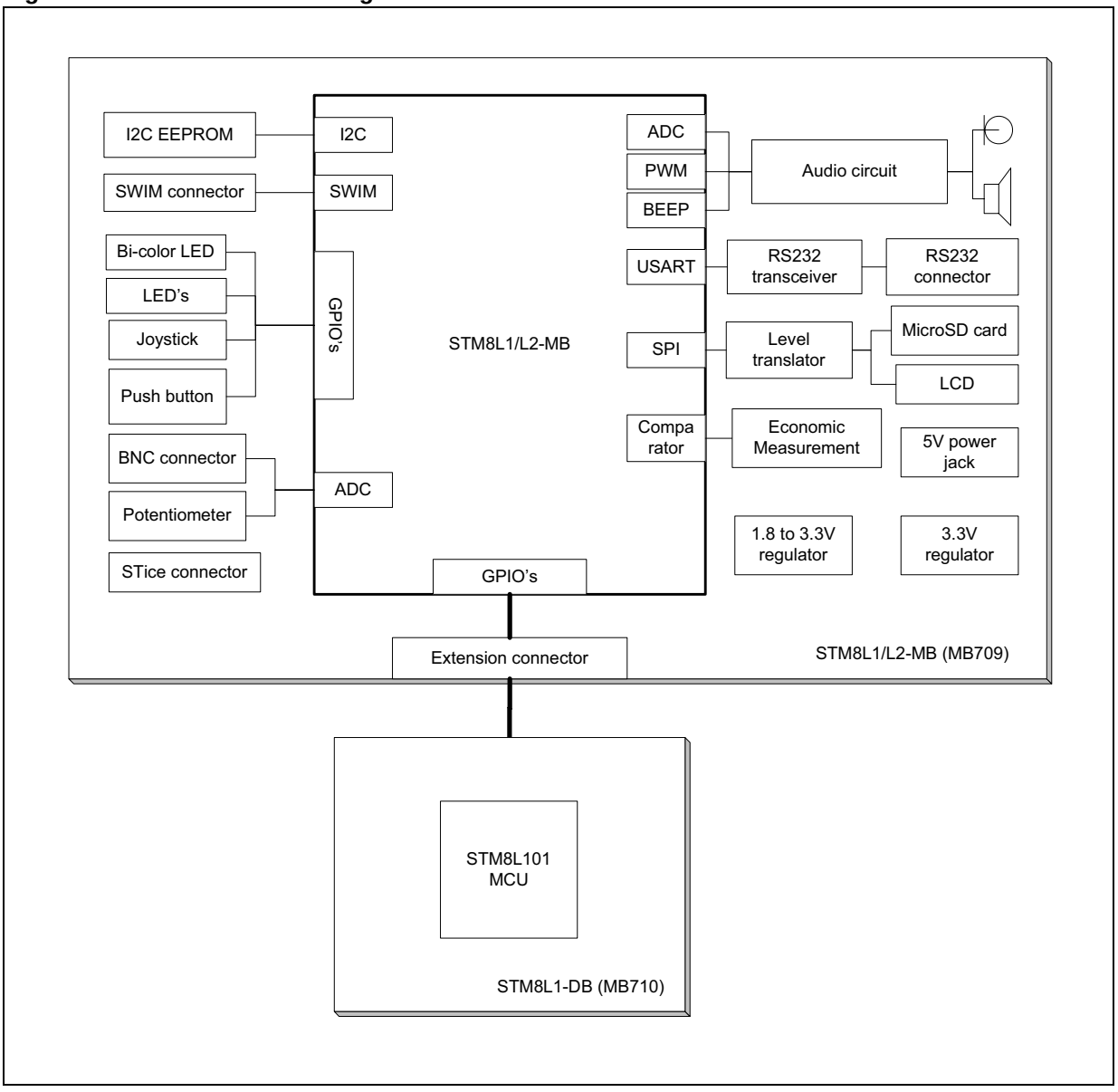


Figure 3. STM8L1/L2 motherboard layout

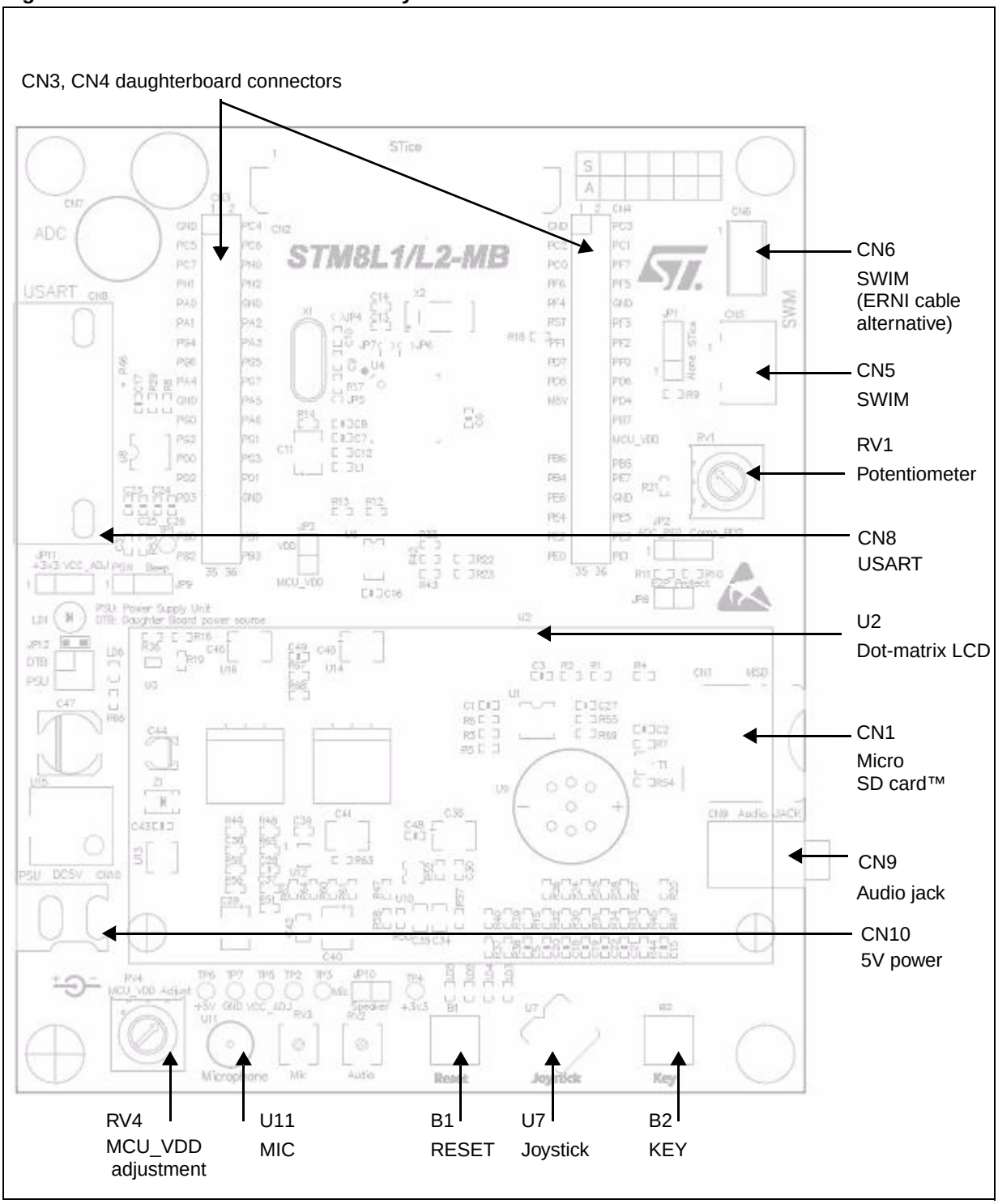
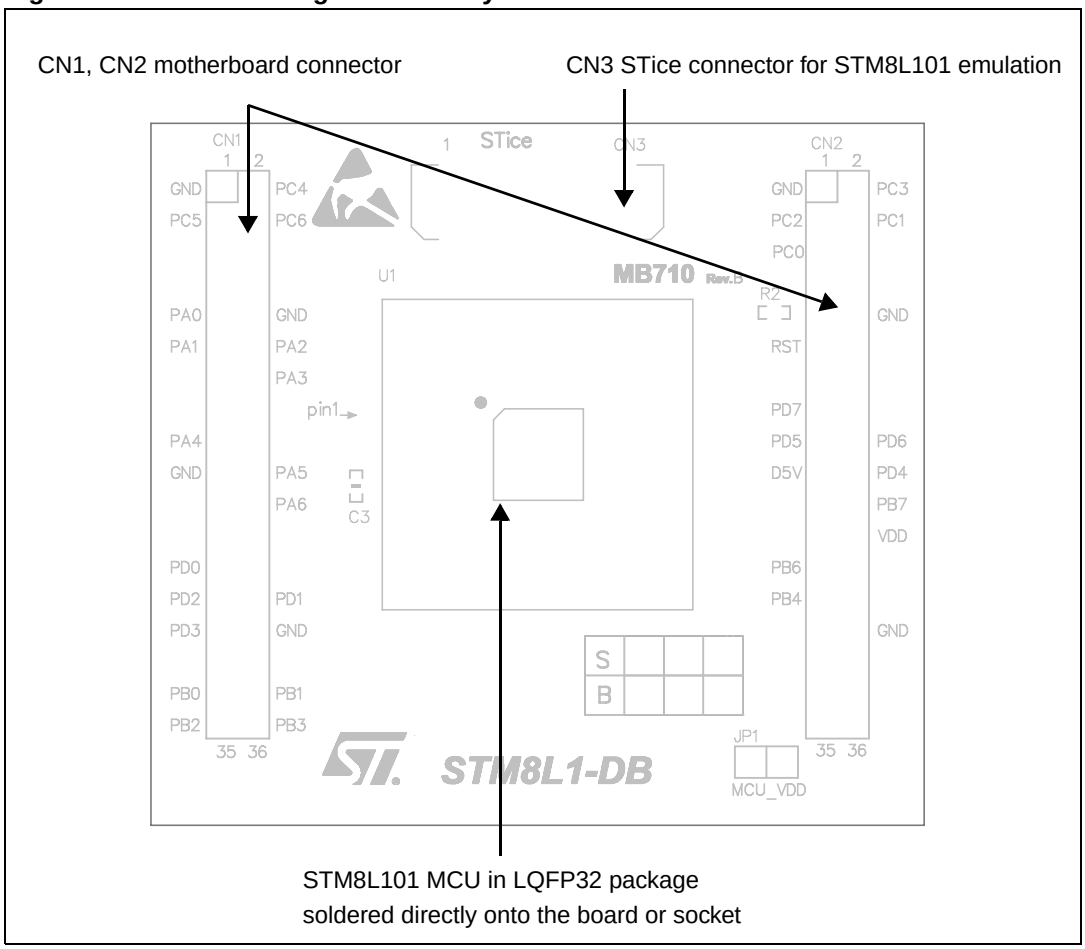


Figure 4. STM8L1 daughterboard layout



2 STM8L1/L2 motherboard

This motherboard is designed to work with an STM8L1 daughterboard.

2.1 Power supply

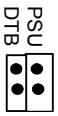
The motherboard is designed to be powered by a 5 V DC power supply and to be protected from a wrong power plug-in event by PolyZen Inc. (auto rearmable fuse) U13. It is possible to configure the evaluation board to provide 5 V power to the daughterboard through the daughterboard connector.

- The motherboard is powered by a 5 V DC power adapter connected to CN10, the power jack on the board (PSU on silk screen for power supply unit).
- 5 V DC power is provided to the daughterboard through an extension connector and can be set by jumper JP12 (DTB for daughterboard on silk-screen).
- MCU_VDD can be selected by setting jumper JP11 and is connected to the daughterboard directly through the daughterboard connector.

The power supply is configured by setting the jumpers JP11 and JP12 as described in *Table 1*.

The LED LD6 is lit when the motherboard is powered correctly. JP3 is no longer used.

Table 1. Power related jumpers

Jumper	Description	Setting
JP12	5 V power from power supply jack (CN10) is connected to the motherboard when JP12 is set as shown to the right: (default setting).	
	5 V power from power supply jack (CN10) is connected to the daughterboard when JP12 is set as shown to the right: In this case the motherboard and daughterboard are powered by a 5 V power supply.	
JP11	MCU_VDD is powered by a fixed 3.3 V power supply when JP11 is set as shown to the right: (default setting).	
	MCU_VDD is powered by a variable power supply from 1.8 V to 3.3 V, adjusted by potentiometer RV4 (bottom left of the board), when JP11 is set as shown to the right:	

2.2 Reset source

The reset signal of the motherboard is low active. Reset sources include:

- Reset button B1.
- Debugging tools from connectors CN5, CN6 and CN2.

The reset pin PA1 of the STM8L101 is either connected to the reset button B1 or to GND by the setting of jumper JP1:

Table 2. Reset related jumpers

Jumper	Description	Setting
JP1	PA1 is connected to GND when JP1 is set as shown to the right: This jumper position is used when the STice is connected to the board in order to configure all IO ports of the MCU in high impedance state. This jumper position is called STice on the silk-screen.	
	PA1 is connected to Reset button when JP1 is set as shown to the right: (default setting). This jumper position is used when the board is alone (not connected to STice). This jumper position is called Alone on the silk-screen.	

2.3 Audio

The motherboard supports both audio recording and playback, but audio recording components (U11 microphone and U12 amplifier) cannot be used with the STM8L101. The speaker can be disabled or enabled by the setting of jumper JP10.

Audio volume can be adjusted using the potentiometer RV2.

Table 3. Audio related jumpers

Jumper	Description	Setting
JP10	Audio power amplifier TS4871 is forced on standby mode when JP10 is not fitted. Default setting: fitted.	
JP11	Either beeper or PWM output can be selected as a source of speaker by setting jumper JP11. The beeper is connected to speaker when JP11 is set as shown to the right: (Beep position on the silk-screen)	
	The PWM output is connected to speaker when JP11 is set as shown to the right: (PSW position on the silk-screen) (default setting).	

2.4 I2C EEPROM

A 64 Kbit I2C EEPROM is connected to the I2C port of the STM8L101.

Write protection can be enabled by the setting of jumper JP8.

Table 4. I2C EEPROM related jumpers

Jumper	Description
JP8	I2C EEPROM U6 is protected from write operation when JP8 is not fitted. Default setting: Fitted

2.5 RS-232

One D-type 9-pin RS-232 connector CN8 is available on the motherboard.

RS-232 interface behavior is not guaranteed when the MCU is powered by an adjustable voltage lower than 3 V.

2.6 MicroSD card

The 64 Mbyte MicroSD card SMS064FF (or 128 Mbyte SMS128FF) connected to the SPI of the STM8L101 through a voltage level translator U1 (shared with LCD) is available on the board. MicroSD card chip select is managed by standard IO port PB4.

2.7 Analog input

The BNC connector footprint present on the board (CN7) cannot be used as it is not connected to the MCU.

2.8 Development and debug support CN5 and CN6

The two debug connectors are available on the motherboard.

- CN5, ERNI 4-pin connector (reference 284697 or 214017) for SWIM debugging. It fits with ERNI connectors provided with standard tools.
- CN6, 2.54 mm pitch low-cost 4-pin connector for SWIM debugging.

2.9 Display and input devices

The 122x32 dot-matrix serial interface LCD (U2) and 4 general purpose LED's (LD2,3,4,5) are available as display devices. A 4-direction joystick, selection key and a general purpose button (B2) are available as input devices.

Table 5. 122x32 dot matrix LCD U13

Pin on U2	Description	Pin connection
1	Vss	GND
2	Vcc	+3V3
3	VO	-
4	CLK	PB5
5	SID	PB6
6	CS	PD1
7	A	+5V
8	K	GND

2.10 Bi-color LED

A bi-color LED is connected to PB0 through a voltage translator which guarantees that the bi-color LED works when the STM8L101 is powered by an adjustable voltage from 1.8 to 3.3 V.

2.11 Economic measurement and potentiometer RV1

The economic measurement solution is demonstrated based on the internal comparator inside the STM8L101 and potentiometer RV1.

As shown in *Figure 5*, the voltage divided by resister bridge R10 and R11 can be measured by using an internal comparator of the STM8L1, with Vref connected to channel 2 of the comparator and an RC charge circuit connected to the COM channel of the comparator.

To measure the voltage Vin from the potentiometer:

1. Compare Vref with the voltage on C8 which is charged by a series of pulses generated by PC4.
2. Record pulse number PN_Vref when the voltage on C8 reaches voltage reference Vref.
3. Another charge pulse PN_Vin can be obtained with voltage connected to CH1 also like PN_Vref.
4. The voltage Vin can be calculated based on both numbers PN_Vref and PN_Vin.

Figure 5. Voltage measurement using internal comparator

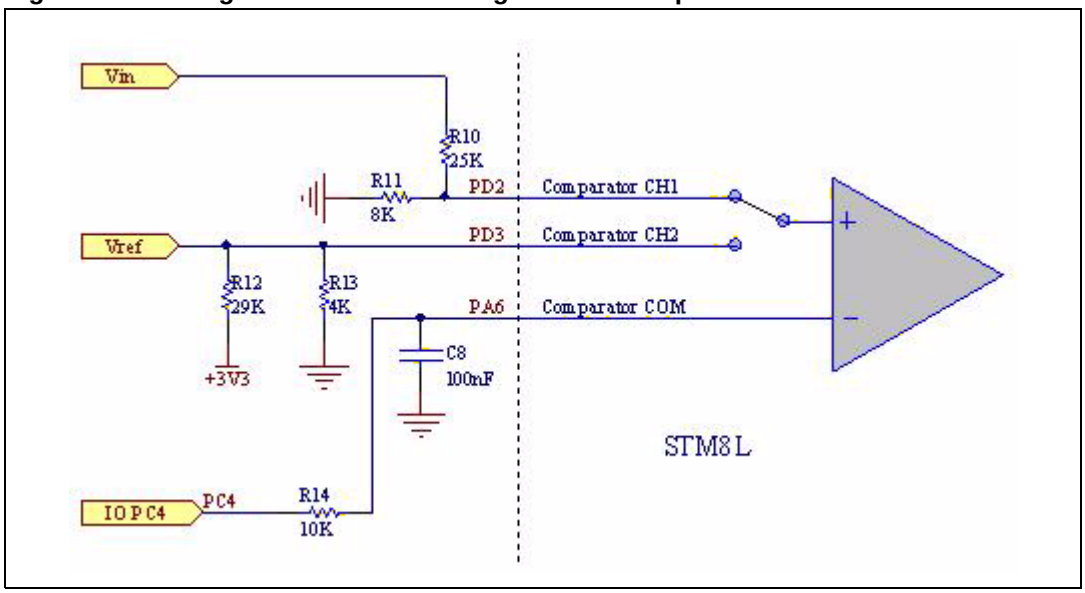


Table 6. Potentiometer RV1 related jumpers

Jumper	Description	Setting
JP2	RV1 is connected to PD2 as one input of the internal comparator when JP2 is set as shown to the right: JP2 position is called Comp_PD2 on the silk-screen.	
	RV1 is connected to PE0 as the analog input for the ADC when JP2 is set as shown to the right: (default setting). JP2 position is called ADC_PE0 on the silk-screen.	

2.12 MicroSD connector CN1

Figure 6. MicroSD connector CN1 viewed from front

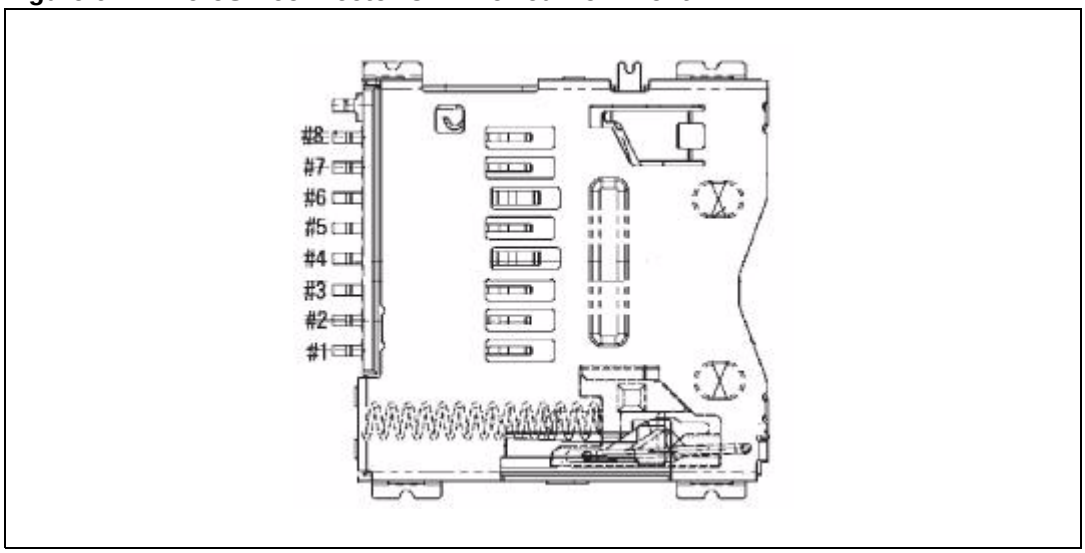


Table 7. MicroSD connector CN1

Pin number	Description	Pin number	Description
1	Reserved	5	SCLK/PB5
2	CS/PB4	6	Vss/GND
3	DI/PB6	7	DO/PB7
4	VDD	8	Reserved
9	GND	10	Not used

2.13 Daughterboard extension connectors CN3 and CN4

Two 36-pin male headers CN3 and CN4 can be used to connect the daughterboard to the motherboard. All GPI/Os are available on it. Please refer to *Table 8* and *Table 9* for pin-out definition.

Table 8. Daughterboard extension connector CN3

Pin number	Description	Pin number	Description
1	GND	2	PC4
3	PC5	4	PC6
5	Reserved	6	Reserved
7	Reserved	8	Reserved
9	PA0	10	GND
11	PA1	12	PA2
13	Reserved	14	PA3
15	Reserved	16	Reserved
17	PA4	18	Reserved
19	GND	20	PA5
21	Reserved	22	PA6
23	Reserved	24	Reserved
25	PD0	26	Reserved
27	PD2	28	PD1
29	PD3	30	GND
31	NC	32	NC
33	PB0	34	PB1
35	PB2	36	PB3

Table 9. Daughterboard extension connector CN4

Pin number	Description	Pin number	Description
1	GND	2	PC3
3	PC2	4	PC1
5	PC0	6	Reserved
7	Reserved	8	Reserved
9	Reserved	10	GND
11	RESET#	12	Reserved
13	Reserved	14	Reserved
15	PD7	16	Reserved
17	PD5	18	PD6
19	D5V	20	PD4
21	NC	22	PB7
23	NC	24	MCU_VDD
25	PB6	26	PB5
27	PB4	28	Reserved
29	Reserved	30	GND
31	Reserved	32	Reserved
33	Reserved	34	Reserved
35	Reserved	36	Reserved

2.14 SWIM connectors CN5 and CN6

CN6 is a low cost 2.54 mm pitch connector to be used by customers who do not have the ERNI cable.

Figure 7. SWIM debugging connector CN5 viewed from above PCB

Table 10. SWIM debugging connectors CN5 and CN6

Pin number	Description	Pin number	Description
1	VDD	2	PA0
3	GND	4	RESET#

2.15 RS-232 connector CN8

Figure 8. RS-232 connector CN8 viewed from front

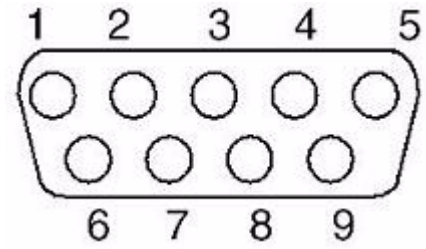


Table 11. RS-232 connector CN8

Pin number	Description	Pin number	Description
1	NC	6	Connect to Pin 4
2	USART_RXD/PC2	7	Connect to Pin 8
3	USART_TXD/PC3	8	Connect to Pin 7
4	Connect to Pin 6	9	NC
5	GND		

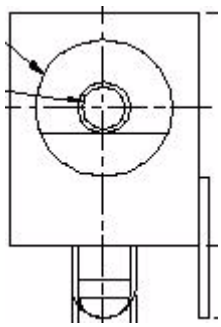
2.16 Audio jack CN9

A 3.5 mm mono audio jack CN9 is available on the motherboard. The speaker U9 is bypassed when an earphone is plugged into CN9 (CN9 is compatible with audio plug NYS231 from NEUTRIK).

2.17 Power connector CN10

The motherboard can be powered from a DC 5 V power supply via the external power supply jack CN10 shown in *Figure 9*. The central pin of CN10 must be positive.

Figure 9. Power supply connector CN10 viewed from front



3 STM8L1 daughterboard

3.1 Power

The STM8L101 MCU is powered by MCU_VDD from the motherboard through an extension connector on the board. It is enabled by setting the jumper JP1 as described in *Table 12*.

Table 12. Power related jumper*

Jumper	Description
JP1	Enables consumption measurement of both VDD and VDDA when the jumper is removed and replaced by an ammeter. Default setting: Fitted.

3.2 Extension connector CN1 and CN2

The 36-pin connectors CN1 and CN2 are designed to be connected to the motherboard. The pin-out definition is the same as CN3 and CN4 on the motherboard which is described in *Section 2.13*.

Warning: On MB710 PCB rev B, CN2 (pin 26) silk-screen PB5 is missing.

3.3 STice connector CN3

STice must be connected to connector CN3 to emulate STM8L101 (**not** on CN2 of the motherboard).

When STice is connected on CN3, jumper JP1 on the motherboard must be set to connect pins 2 and 3 in order to keep STM8L101 MCU on reset as explained in *Section 2.2*.

Figure 10. STice debugging connector CN3

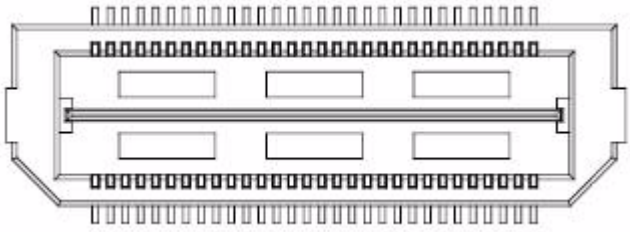


Table 13. Trace debugging connector CN3

Pin number	Description	Pin number	Description
1	RESET#	2	PA2
3	PA3	4	PA4
5	PA5	6	PA6
7	GND	8	VDD
9	PD0	10	PD1
11	PD2	12	PD3
13	PB0	14	PB1
15	PB2	16	PB3
17	PB4	18	PB5
19	PB6	20	PB7
21	PD4	22	PD5
23	PD6	24	PD7
25	PC0	26	PC1
27	PC3	28	PC3
29	PC4	30	PC5
31	PC6	32	PA0
33-60	NC		

4 Schematics

4.1 STM8L1/L2 motherboard schematic

Figure 11. STM8L1 motherboard schematic

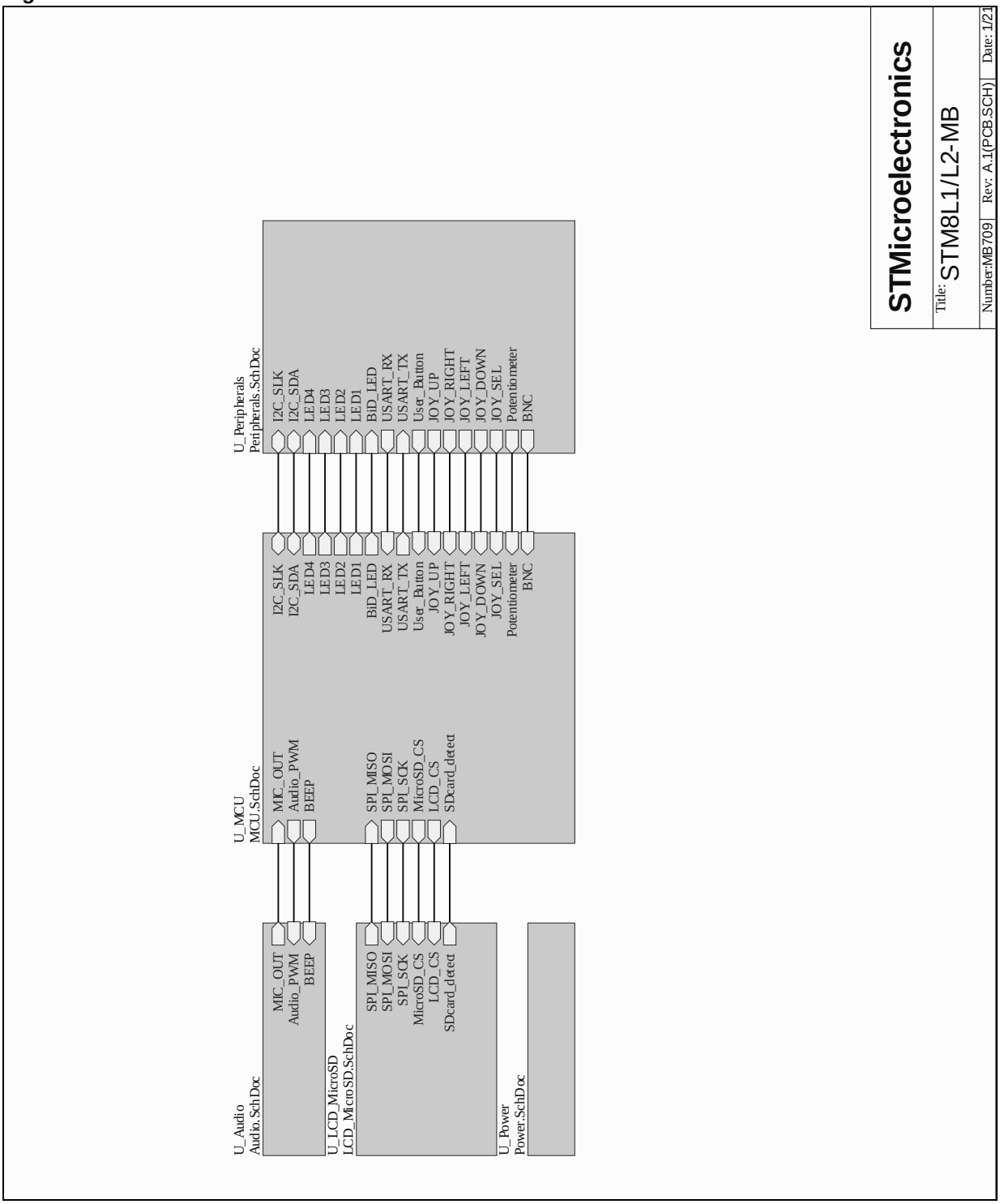


Figure 12. STM8L1 motherboard MCU schematic

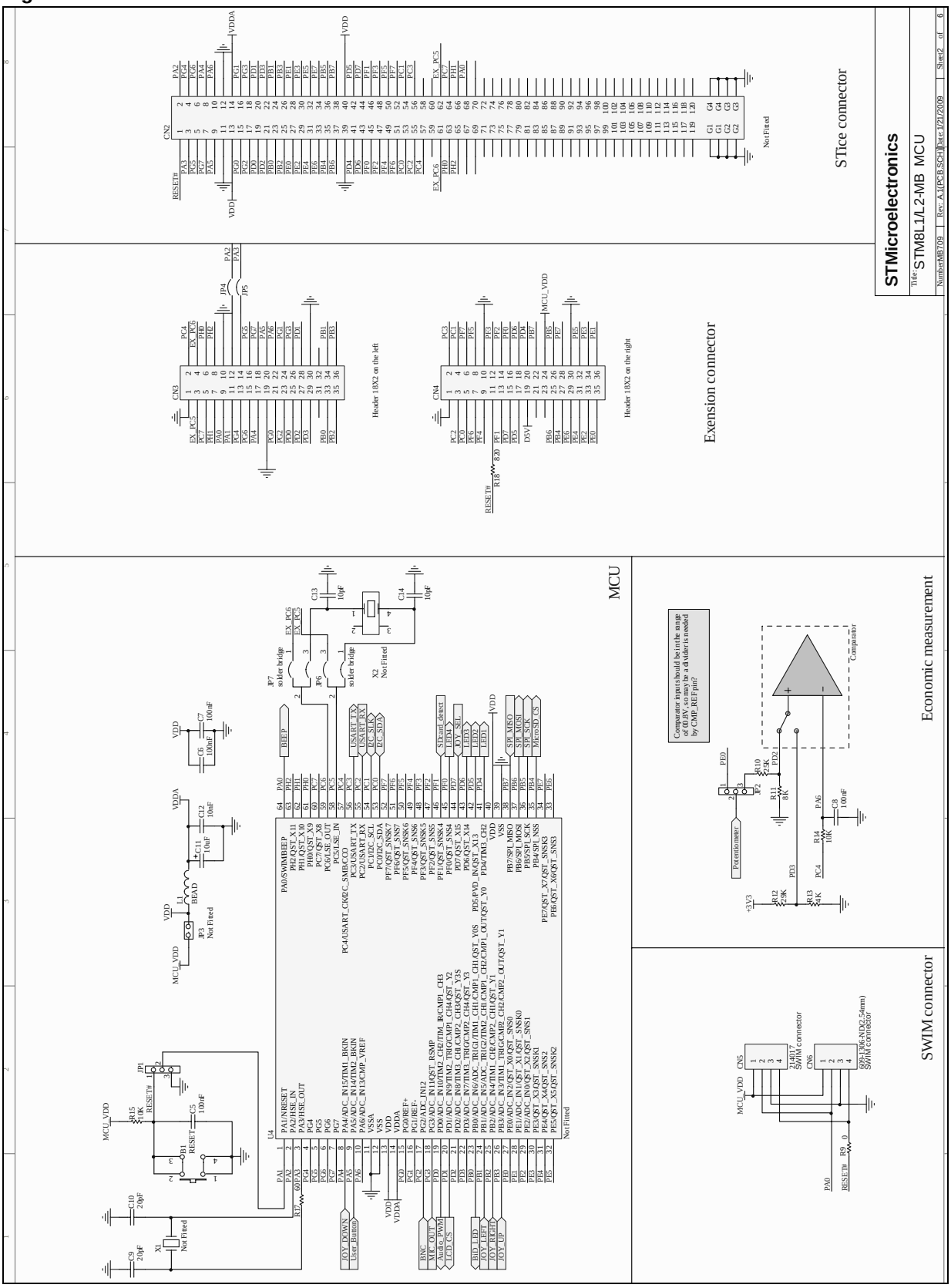


Figure 13. STM8L1 motherboard LCD and SD schematic

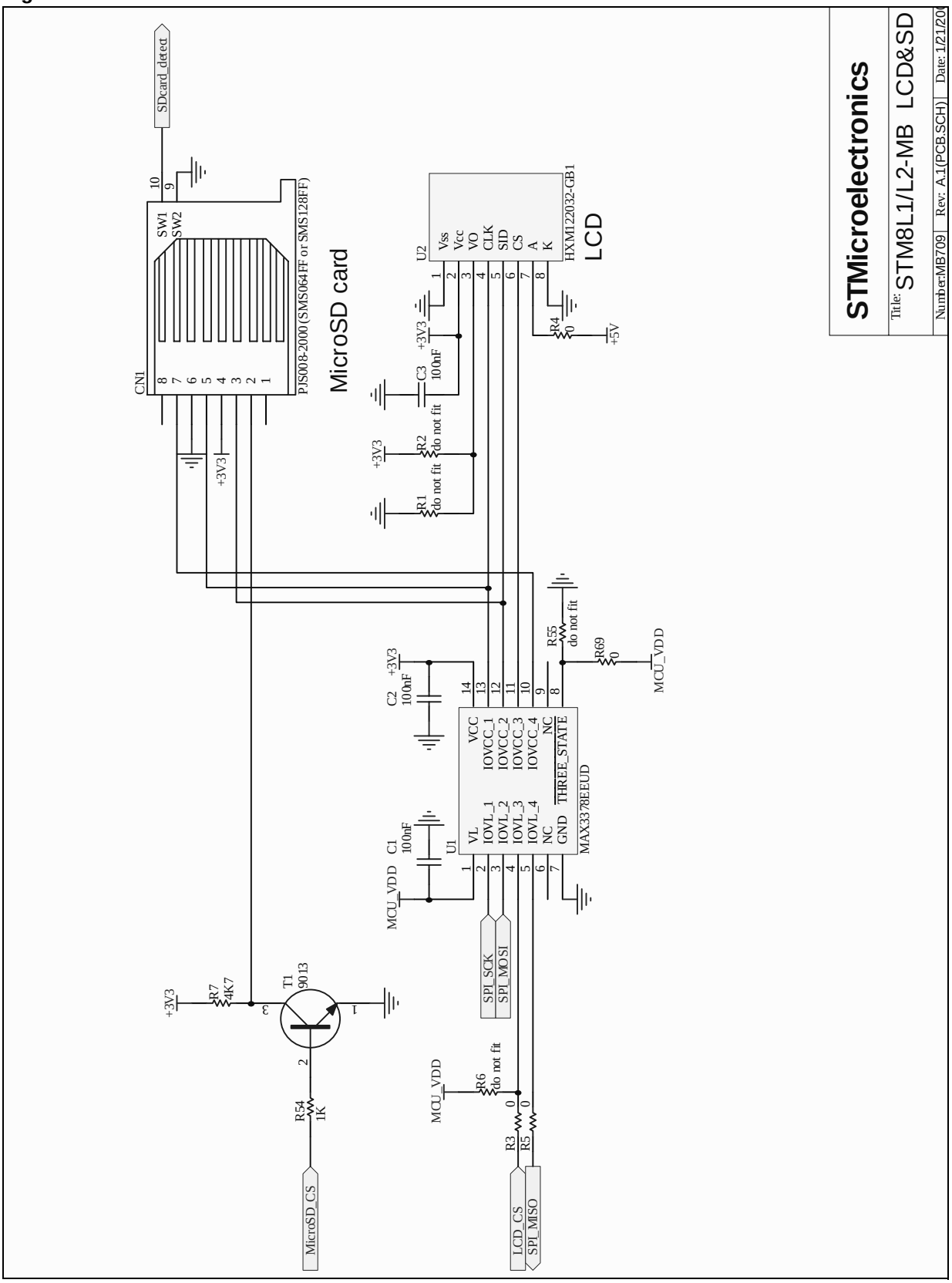


Figure 14. STM8L1 motherboard peripherals schematic

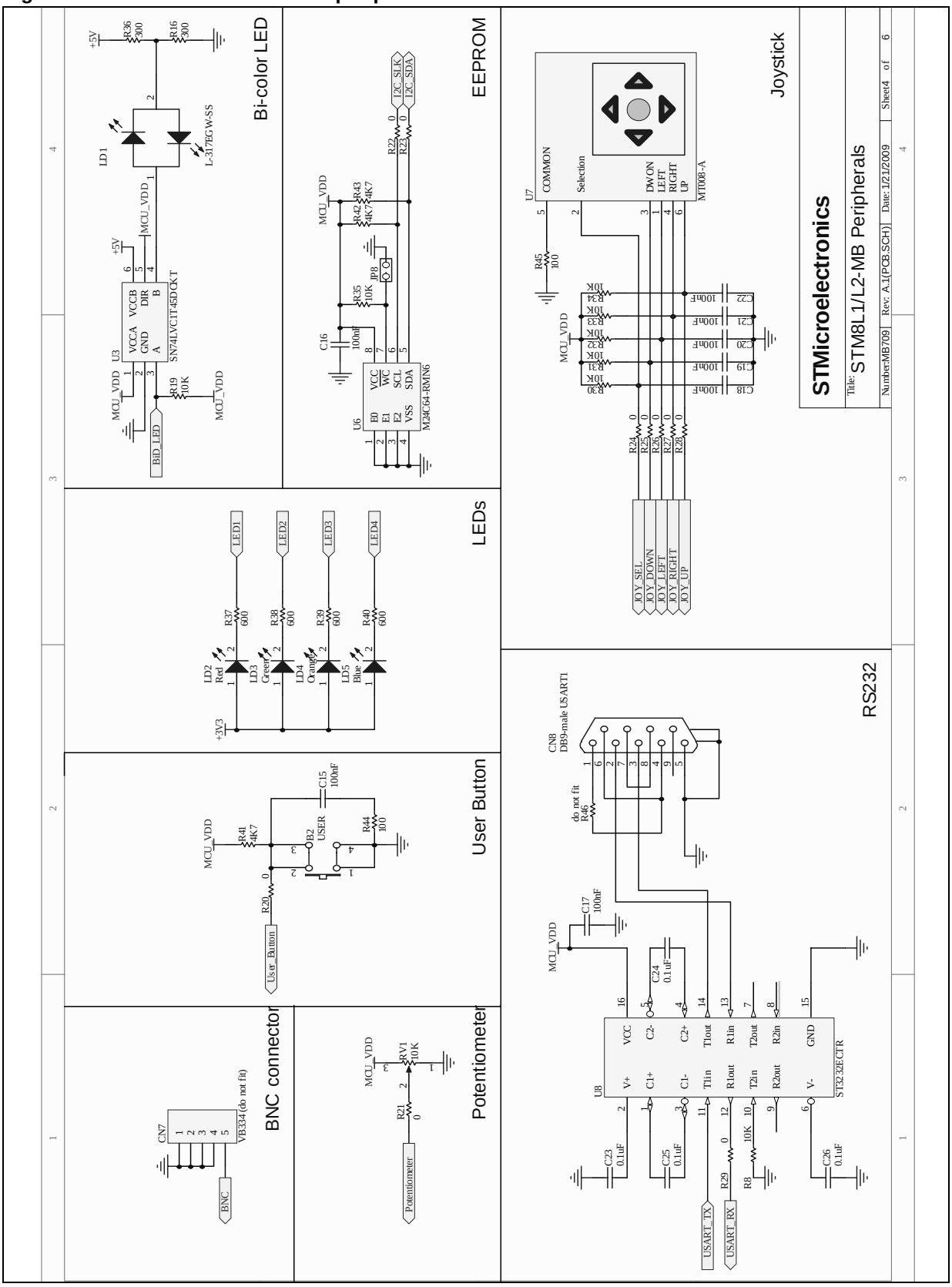


Figure 15. STM8L1/L2 motherboard audio schematic

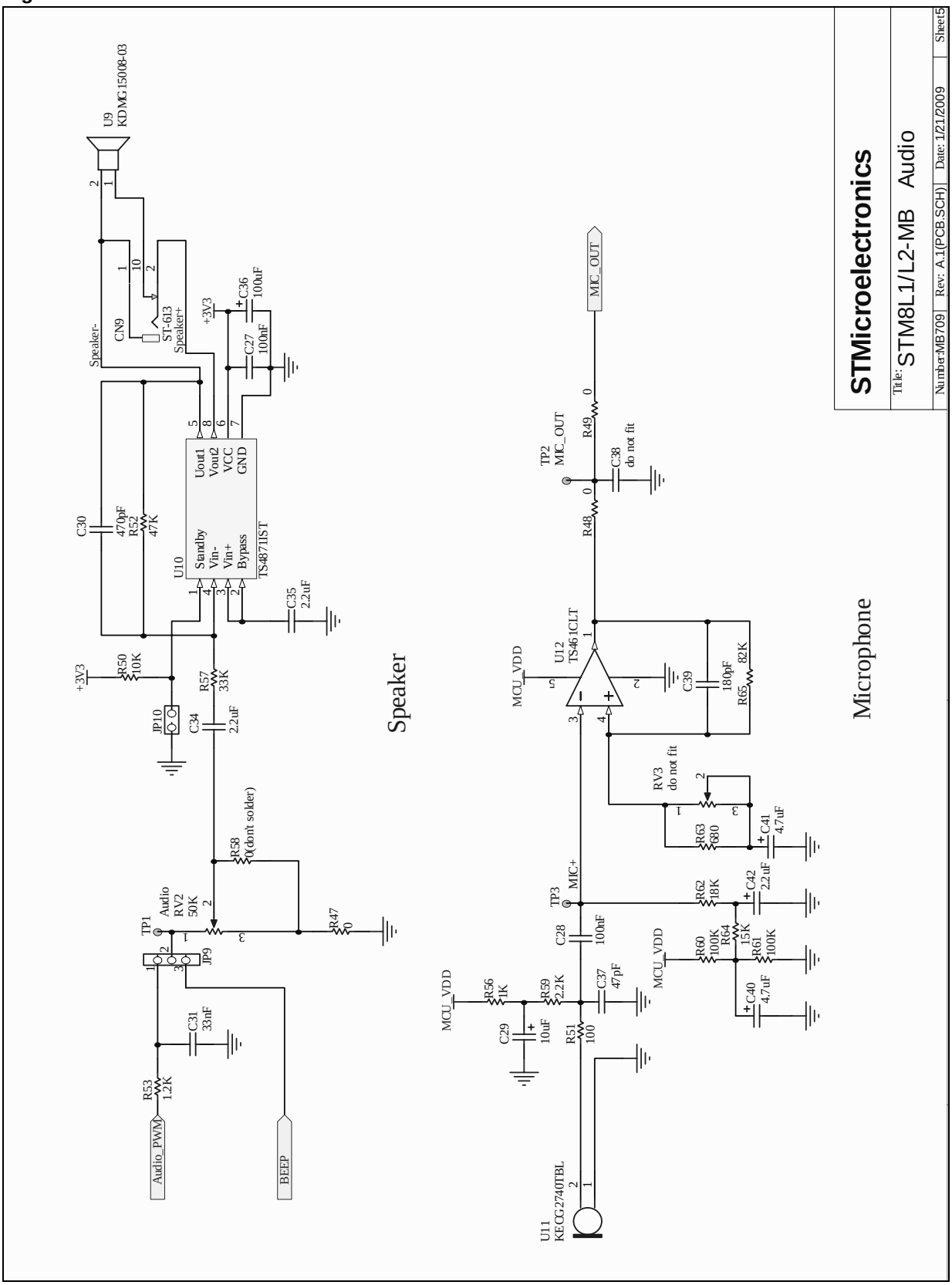
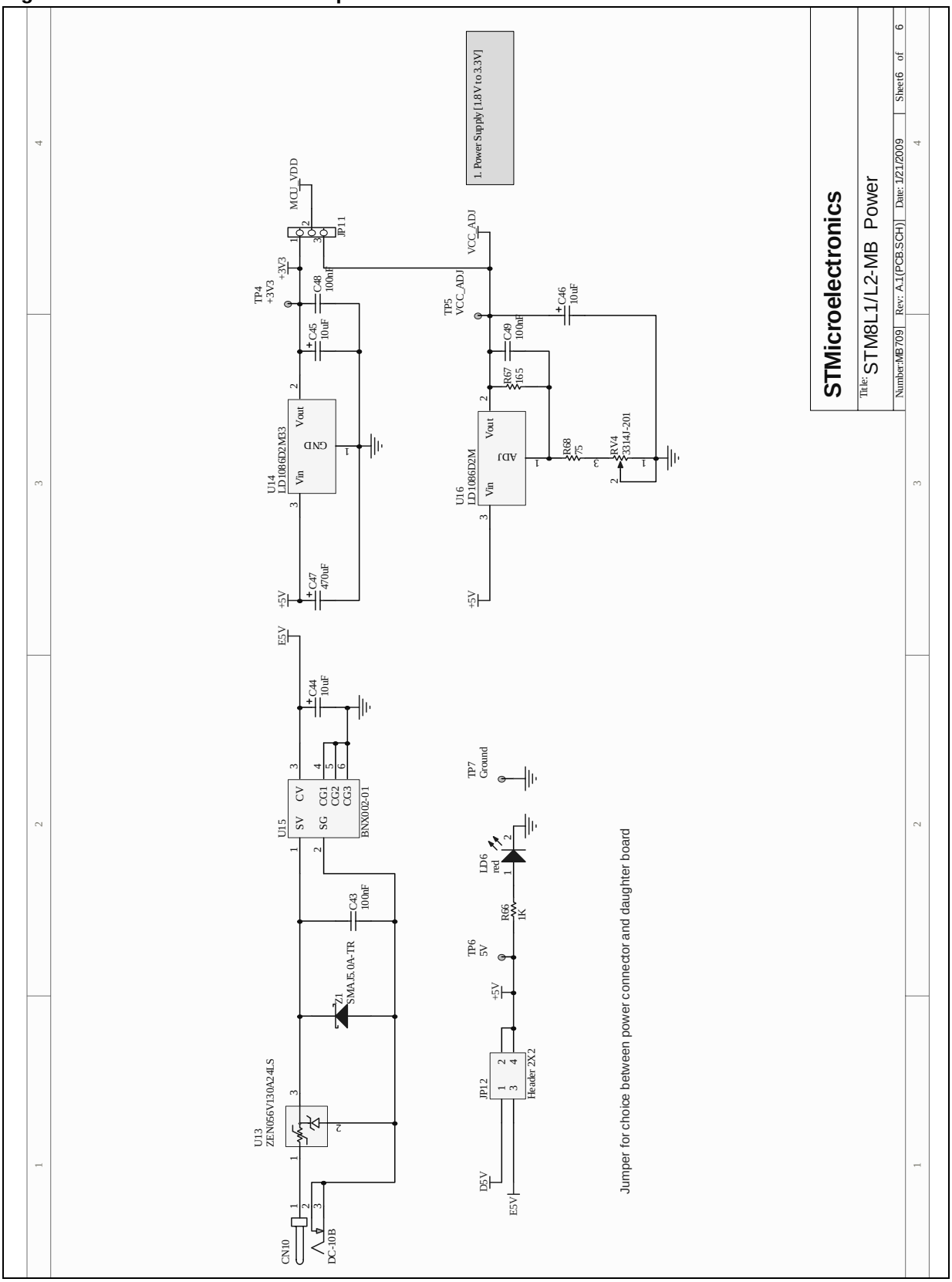
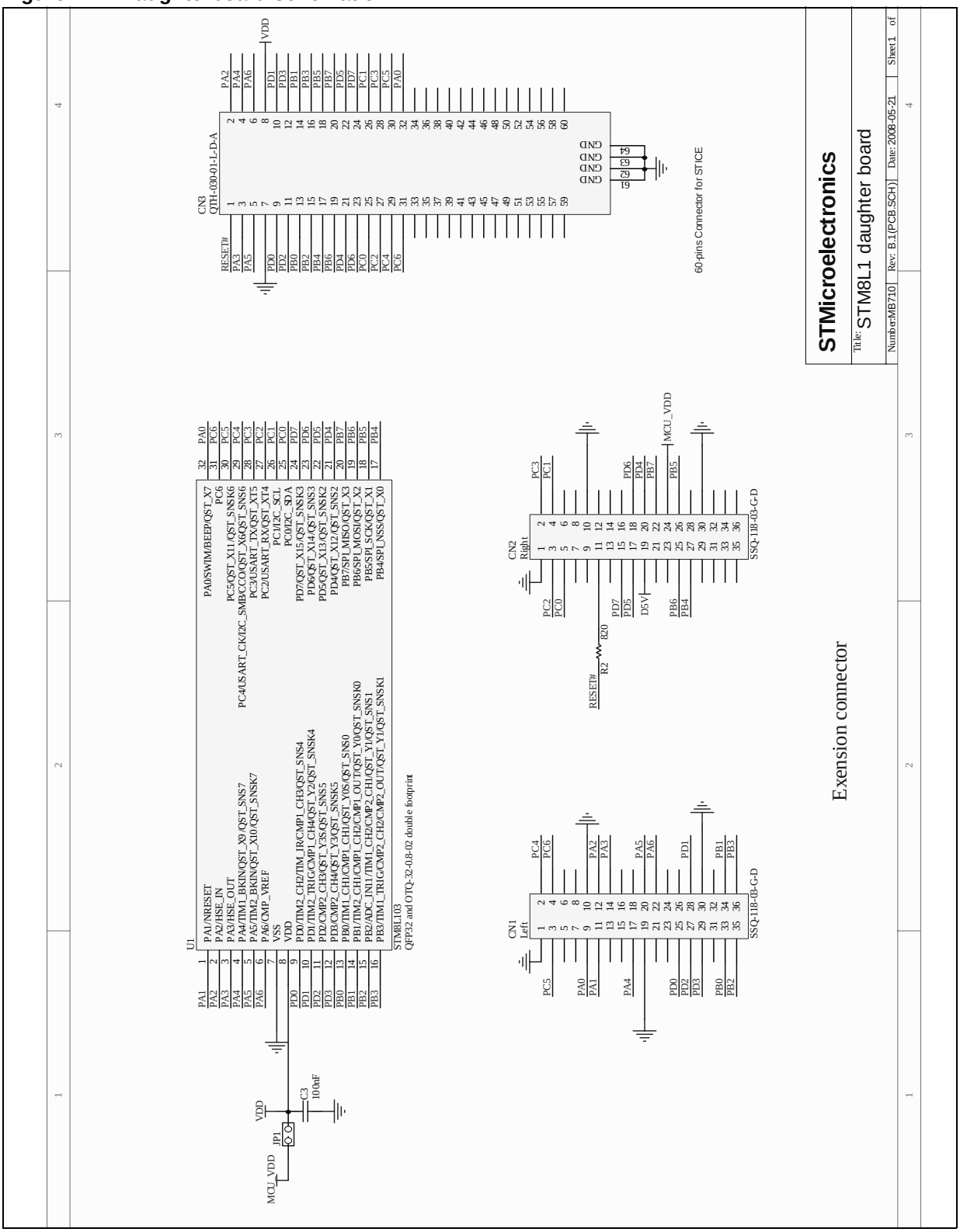


Figure 16. STM8L1 motherboard power schematic



4.2 STM8L1-DB daughterboard schematic

Figure 17. Daughterboard schematic



Appendix A STM8L101-EVAL I/O assignment

Table 14. STM8L101-EVAL input and output assignment

STM8L101 pin number	Pin name	STM8L101-EVAL pin assignment		STM8L101 pin number	Pin name	STM8L101-EVAL pin assignment
1	PA1 - NRESET	RESET		-	PE6	?
2	PA2	HSE IN		-	PE7	?
3	PA3	HSE OUT		17	PB4	SD_card_CS
-	PG4	?		18	PB5	SPI_SCK
-	PG5	?		19	PB6	SPI_MOSI
-	PG6	?		20	PB7	SPI_MISO
-	PG7	?		-	VSS	?
4	PA4	Joystick down		-	VDD	?
5	PA5	User button		21	PD4	LED 1
6	PA6	CMP_VERF		22	PD5	LED 2
-	VSSA	?		23	PD6	LED 3
7	VSS	?		24	PD7	Joystick select
8	VDD	?		-	PF0	?
-	VDDA	?		-	PF1	?
-	PG0	?		-	PF2	?
-	PG1	?		-	PF3	?
-	PG2	?		-	PF4	?
-	PG3	?		-	PF5	?
9	PD0	Audio PWM_out		-	PF6	?
10	PD1	LCD_CS		-	PF7	?
11	PD2	CMP2_Potentiometer		25	PC0	I²C_SDA_E2P
12	PD3	CMP2_VREF		26	PC1	I²C_SCL_E2P
13	PB0	Bi-color LED		27	PC2	USART_RX
14	PB1	Joystick left		28	PC3	USART_TX
15	PB2	Joystick right		29	PC4	VREF_CTRL
16	PB3	Joystick up		30	PC5	?
-	PE0	?		31	PC6	?
-	PE1	?		-	PC7	?
-	PE2	?		-	PH0	?
-	PE3	?		-	PH1	?
-	PE4	?		-	PH2	?
-	PE5	?		32	PA0	SWIM / Beep

5 Revision history

Table 15. Document revision history

Date	Revision	Changes
06-Feb-2009	1	Initial release.

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